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THE DISCOVERY OF *HYDORA*, A HITHERTO AUSTRALIAN-NEW ZEALAND GENUS OF RIFFLE BEETLES, IN AUSTRAL SOUTH AMERICA (COLEOPTERA: ELMIDAE)

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Abstract.—The genus *Hydora* (Coleoptera: Elmidae), previously known only from New Zealand and Australia, is reported from southern Chile and Argentina for the first time. Two new taxa, *Hydora* **annectens,** n. sp., and *Hydora* **lenta,** n. sp., are described, keyed, and compared with New Zealand congeners; their distinguishing characters and typical biotopes are illustrated. The known distributions of the new taxa are plotted on a map.

Among various Chilean aquatic beetles received for identification from Allan Ashworth were five specimens of an interesting larine elmid beetle which keys readily to the genus *Hydora* in Hinton's (1940) key to the tribes (now subfamilies) of Elmidae. Other specimens of this genus had been found previously by a few other collectors but the species remained undescribed; the earliest collection known to us was made by W. Wittmer in 1950. This was followed by collections made by A. Kovacs (1958, 1959, 1961); R. L. Usinger (1962); O. S. Flint, Jr. (1966, 1969, 1974, 1978); H. P. Brown (1971); A. C. Ashworth, J. W. Hoganson, and H. Mooers (1977, 1979); and P. J. Spangler (1978). These taxa are described below to make the names available for use by Allan Ashworth and his associates in their studies of fossil insects in Chilean peat bogs and to report, for the first time, the occurrence in austral South America of this Australian-New Zealand genus.

The new elmid beetles described below represent the fifth genus of aquatic beetles (other than some cosmopolitan genera) that are known to occur or whose closest relatives are known to occur in austral South America and New Zealand and Australia. The four genera previously reported are: *Austrolimnius*, Elmidae (Hinton, 1965); *Lancetes,* Dytiscidae (Sharp, 1882); *Meropathus*, Hydraenidae (Perkins, 1980); and *Cylorygmus*, Hydrophilidae

Table 1. Comparison of characters between New Zealand and austral South American taxa.

	New Zealand Taxa	Austral South American Taxa
1. Constriction across apical ⅓ of pronotum.	Very shallow and indistinct in some species, distinct in others.	Moderately impressed dorsally, distinct laterally.
2. Elytra.	With 11 rows of coarse, distinct punctures; 2nd (accessory) row incomplete, restricted to basal ¹/₅ of length; all rows distinct on base in most species.	With 11 rows of coarse to moderately fine punctures; 2nd (accessory) row incomplete, restricted to basal ¹/₅ of length; 2nd, 3rd, and 4th rows fine to effaced on base (*H. lenta*) or all distinct on base (*H. annectens*).
3. Elytral disc at basal ⅓.	Evenly rounded in some species, distinctly depressed in others.	Distinctly depressed.
4. Ultimate segment of maxillary and labial palpi.	Moderately to strongly swollen.	Strongly swollen.

(d'Orchymont, 1933). The occurrence of taxa of *Hydora* in Argentina and Chile thus represents the second genus in the Elmidae with congeners in the Australian-New Zealand areas.

Specimens of *Hydora* are uncommon in collections. As far as we know, only 97 specimens representing the genus have been collected in austral South America since the first specimens were collected 30 years ago. To determine whether they were congeneric taxa, the two new species from South America were compared with 25 specimens from New Zealand representing *Hydora angusticollis* (Pascoe), *H. obsoleta* Broun, *H. picea* (Broun), and other species. Although many of the specimens from New Zealand were old and missing some of their appendages, comparisons of male genitalia and several external characters were possible and showed that all taxa examined are very similar in most characters and the differences are minor and ones of degree (see Table 1). Therefore, the South American taxa are considered to be congeners of the genus *Hydora*.

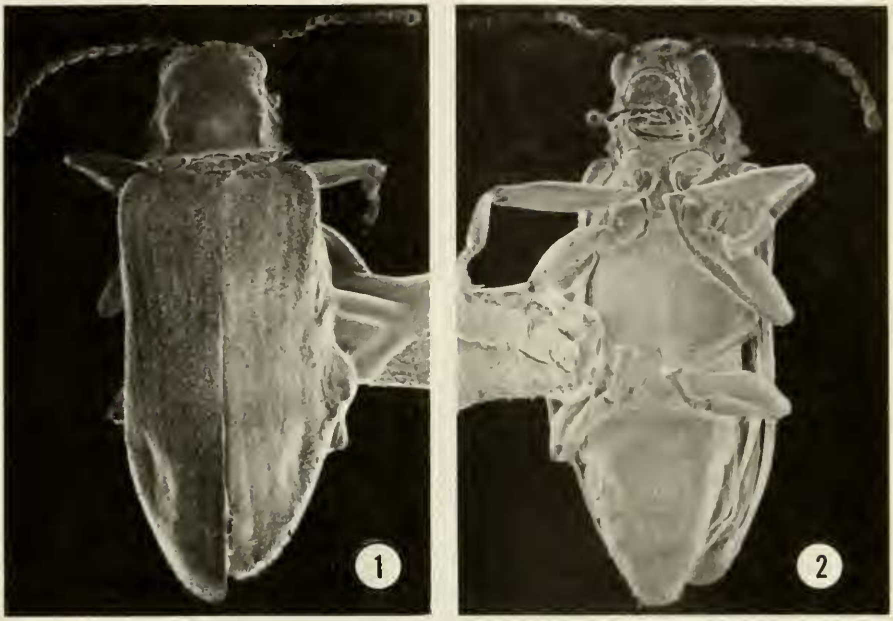
In comparing the specimens from both continents we also found that the total length of each antenna of all available males from austral South America was slightly more than twice as long as the side of the pronotum, whereas the total length of the antennae of the females was only about one-third longer than the length of the side of the pronotum. This sexual difference in antennal length does not appear to hold true for New Zealand species.

INTERCONTINENTAL RELATIONSHIPS

In his revision of the Australian species of the intercontinental elmid genus *Austrolimnius*, Hinton (1965) mentions that the environmental requirements of many organisms are known well enough to distinguish between those which can tolerate a wide range of ecological conditions and those which have much more rigid requirements. Furthermore, he points out that (1) organisms that have narrowly restricted ecological requirements tend to disperse slowly and are not commonly transported accidentally; and, conversely, (2) tolerant taxa disperse rapidly and are more liable to be transported accidentally. Therefore, if the first situation applies, the evidence for past land connections is strengthened and, conversely, if the second situation appiies, the evidence is much weakened. Most elmids have narrowly restricted ecological requirements and they are good subjects for biogeographical analysis when they exhibit discontinuous distribution such as seen in *Austrolimnius* and now in *Hydora*.

However, the arguments for past continental connections between austral South America and New Zealand-Australia are not quite as convincing for the genus *Hydora* as they are for *Austrolimnius* for the following reasons. Members of the genus *Austrolimnius*, like all other elmids, obtain their oxygen supply under water by a plastron, i.e., a dense covering of hairlike or scalelike setae usually on various parts of their ventral surface. This method of obtaining oxygen is restricting because it requires water with a high oxygen content. Furthermore, *Austrolimnius* belongs to the subfamily Elminae and members of this subfamily normally are capable of flight for only a few days after they become adults and before they enter their aquatic habitat where their wing muscles soon atrophy, for they spend the remainder of their lives under water. Therefore, the presence in both South America and New Zealand-Australia of congeneric taxa of *Austrolimnius* which are restricted by habitat requirements and extremely low flight potential provides strong support for the hypothesis that the two continents were formerly one that divided, drifted apart, and carried ancestral taxa along on both land masses.

The disjunct distribution of members of the genus *Hydora* is somewhat less convincing evidence of past drifting of continents because the members of the genus belong to the elmid subfamily Larinae and larine elmids normally live above water, usually at or near the air-water interface. Although larine elmids generally occur in oxygen-rich, clean streams and brooks, they seem to be less restricted than the members of the Elminae because they do retain functional flight muscles and most are not restricted to a life under water. (However, the calcareous encrustations on certain specimens of *Hydora* from New Zealand suggest prolonged immersion.) The specimens of *Hydora* we collected were notably passive and could be easily approached and collected by hand. Specimens of *Hydora* evidently do fly



Figs. 1, 2. *Hydora annectens*, habitus. 1, Dorsum, 24×. 2, Venter, 24×.

under certain conditions because a few specimens were collected by Ashworth et al. by "light trapping," but we believe they do not fly as readily as do most members of the subfamily with which we are familiar. Therefore, we believe the presence of the genus *Hydora* in South America as well as New Zealand-Australia is additional supportive evidence of dispersal of congeners by drifting continents.

Hydora annectens Spangler and Brown, New Species

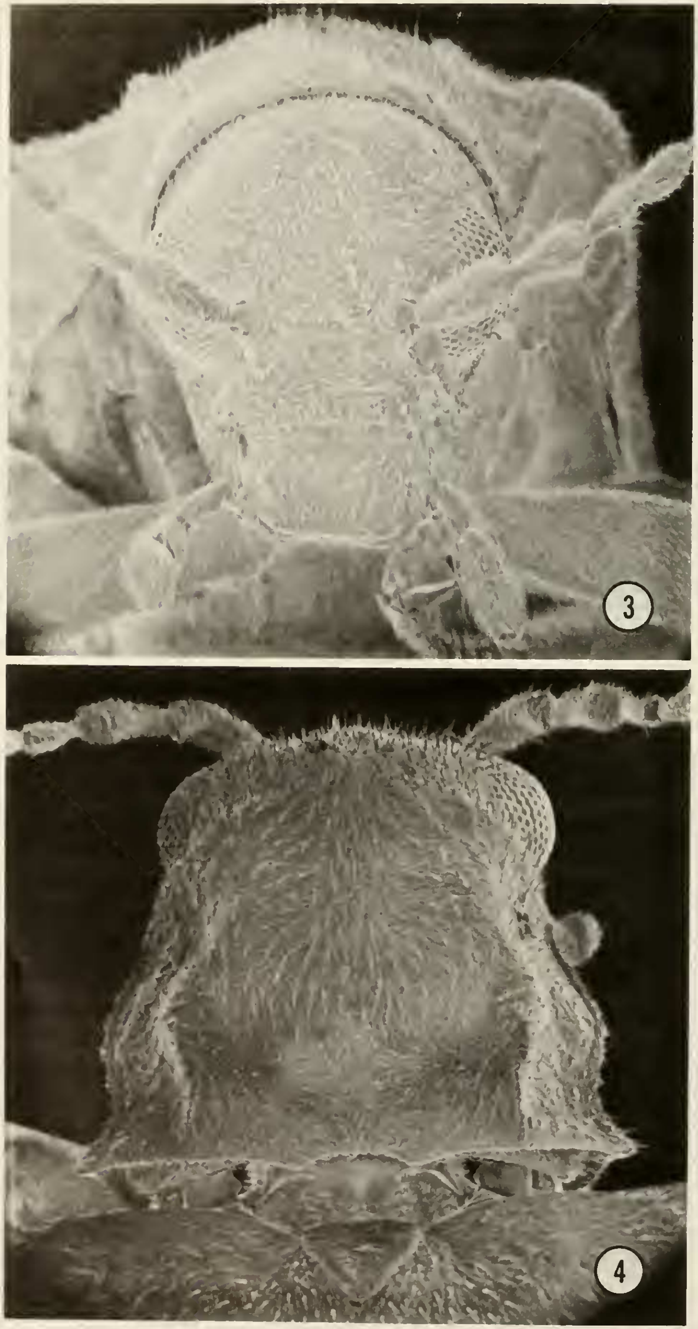
Figs. 1–5, 8

Holotype male.—Body form and size: Elongate, narrow, subparallel (Figs. 1, 2); dorsal surface feebly convex. Length 3.6 mm; greatest width 1.5 mm.

Coloration: Integument nigro-cinereous except trochanters and basal ⅔ of femora dark yellowish brown. Body covered with dense, short, recumbent, yellowish hairlike setae.

Head (Fig. 3): Microreticulate and finely, densely punctate; punctures separated by their width. Interocular width twice width of an eye. Antenna long; total length twice as long as side of pronotum; arising from lower inner corner of eye.

Thorax: Pronotum (Fig. 4) about $^{4}/_{5}$ as long as width of base; transverse constriction across apical ⅓, moderately impressed dorsally and distinctly



Figs. 3, 4. *Hydora annectens*. 3, Head, 75×. 4, Pronotum, 75×.

impressed laterally; anterior margin feebly arcuate; anterolateral angles obtuse, not produced; sides sinuous; base trisinuate; posterolateral angles acute, not produced posteriorly; a broad sublateral carina on basal ½; disc between carinae tumid; depressed between sublateral carinae and posterolateral angles; surface microreticulate and punctate as on head but punctures obscured by pubescence. Elytra almost 5× longer than pronotum; depressed on disc at about basal ⅓; apices evenly rounded; humeri moderately gibbous. Each elytron with 11 rows of coarse punctures; 2nd (accessory) row incomplete and restricted to about basal ⅕; coarse punctures separated by ½ their width or by their width; intervals almost flat, finely punctate, punctures separated by about their diameter. Scutellum rather flat, moderately large, triangular; sides slightly longer than width of base. Prosternum short in front of forecoxae; prosternal process elongate, moderately narrow (Fig. 2), about 3.6× longer than wide, apex blunt and fitting into a deep fovea in mesosternum. Mesosternum with a deep transverse depression between midcoxae. Metasternum ridgelike behind mesosternal depression then depressed before becoming swollen on discal area; entire surface pubescent; short, narrow, glabrous, longitudinal groove on posterior ½ in front of hindcoxae. Tarsal claws moderately stout, unmodified.

Abdomen (Fig. 2): Sterna uniformly pubescent; moderately coarsely, densely punctate; punctures separated by ½ to 2× their width. Lateral margins of sterna 1 to 4 (but especially 2 and 3) expanded and upturned forming a flange which clasps epipleura.

Male genitalia: As illustrated (Fig. 5).

Female.—Similar to male except antenna shorter, only about ⅓ longer than side of pronotum.

Variations.—Specimens varied as follows. Prosternal process shows slight variation in width; in a few specimens, process shows a weak to moderate (strong in 1 specimen) longitudinal carina on apical ⅔. Sublateral carinae on base of pronotum are distinct but vary from low to high ridges. Several specimens show a metallic blue-green reflection on pronotum and sometimes elsewhere as the light of the illuminator strikes the cuticle at different angles. Specimens varied in length from 3.6–4.5 mm.

Type-data.—Holotype ♂: CHILE: *Llanquihue Province:* Pt. Varas (24 km E), Parque Nacional de Puyehue, Site 7, El. 50 m, 20 Nov. 1977, Ashworth, Hoganson, Mooers; USNM Type No. 76182, deposited in the National Museum of Natural History, Smithsonian Institution. Allotype: same data as for holotype.

Paratypes: ARGENTINA: *Neuquén Province:* Rio Quilquihue, at Quilquihue, 26 Jan. 1974, O. S. Flint, Jr., 4 ♂, 19 ♀ (USNM); Trib. Arroyo Trompul W. San Martín de los Andes, 23 Feb. 1978, C. M. and O. S. Flint, Jr., 1 ♀ (USNM). *Rio Negro Province:* El Bolson, 20 Sept. 1958, A. Kovacs, 3 ♀ (BMNH); El Bolson, 20 Oct. 1958, A. Kovacs, 2 ♂, 11 ♀

(BMNH); El Bolson, 5 Dec. 1958, 10 ♀; El Bolson, 18 Dec. 1958, A. Kovacs, 2 ♂, 21 ♀ (BMNH); El Bolson, 20 Feb. 1959, A. Kovacs, 1 ♀ (BMNH); El Bolson, 29 Nov. 1950, W. Wittmer, 1 ♀ (BMNH); Ñorquincó, 24 Feb. 1961, A. Kovacs, 1 ♀. All specimens collected by A. Kovacs and listed above are mislabeled "CHILE." CHILE: *Cautín Province:* Rio Pedregosos, 4 Jan. 1966, Flint and Cekalovic, 1 ♀ (USNM). *Llanquihue Province:* Same data as for holotype, 1 ♂; Ensenada, Lago Llanquihue, 3 Jan. 1962, R. L. Usinger, 1 ♀ (JFL). *Malleco Province:* Tolhuaca, 9 Jan. 1962, R. L. Usinger, 1 ♂ (JFL). *Ñuble Province:* East of Chilan, Rio Pinto, 24 Oct. 1969, Flint and Barria, 5 ♀ (USNM). *Osorno Province:* Aguas Calientes, Parque Nacional de Puyehue, Site 16A, El. 460 m, 9 Jan. 1979, A. C. Ashworth, J. W. Hoganson, 1 ♀ (UND); Playa Puyehue, Parque Nacional de Puyehue, Site 30, El. 185 m, 22 Dec. 1977, Ashworth, Hoganson, Mooers, 1 ♂ (UND). *Talca Province:* Rio Claro, SW Molina, 1 Nov. 1971, Harley P. Brown, 5 ♂, 2 ♀ (SMSH).

Specimens will be deposited in the British Museum (Natural History), London; California Academy of Sciences, San Francisco; Canadian National Collection, Ottawa; Museo Argentino de Ciencias Naturales, "Bernardino Rivadavia," Buenos Aires; Museo National de Historia Natural, Santiago; Muséum National d'Histoire Naturelle, Paris; Institut royal des Sciences Naturelles de Belgique, Bruxelles; Stovall Museum of Science and History, Norman, Oklahoma; and Zoologische Sammlung Bayerischen Staates, München.

Etymology.—The name *annectens* is from annectens, L.—linking, joining; in reference to the suggestion that the occurrence of congeners of *Hydora* in austral South America and New Zealand-Australia is evidence of continental drift.

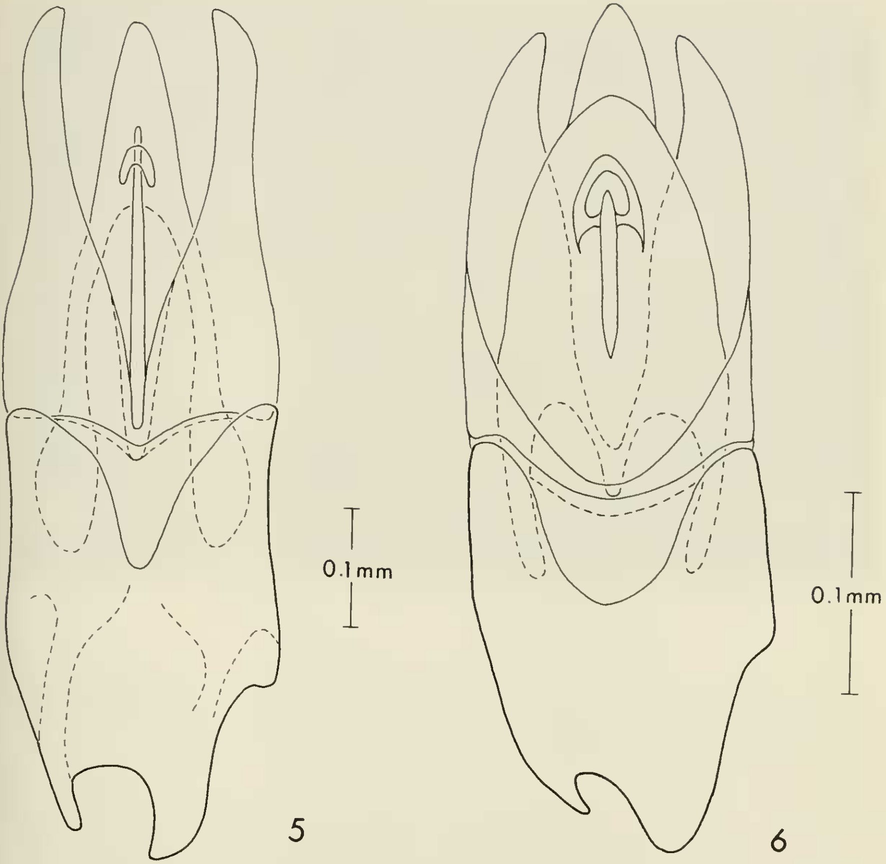
Habitat.—The specimens described above were collected at light traps, by trampling marginal vegetation in aquatic habitats, under rocks near aquatic habitats, and picking by hand from piles of driftwood stranded by receding flood waters in and along the margins of streams.

Hydora lenta Spangler and Brown, New Species
Figs. 6–8

Holotype male.—Body form and size: Elongate, narrow, subparallel; dorsal surface feebly convex except each elytron with a broad, shallow depression each side of suture at about basal ⅓ and each elytron with a shallow, elongate sublateral depression at about apical ¼. Length 2.9 mm; greatest width 1.1 mm.

Coloration: Integument nigro-cinereous except forecoxa, midcoxa, trochanters, and basal $^4/_5$ of femora reddish yellow. Body covered with dense, short, recumbent, yellowish hairlike setae.

Head: Microalutaceous; with few moderately coarse punctures on clyp-



Figs. 5, 6. Male genitalia, ventral view. 5, *Hydora annectens*. 6, *H. lenta*.

eus and labrum, punctures obscured by pubescence. Interocular width slightly more than twice width of an eye. Antenna long; total length twice as long as length of pronotum; arising from lower inner corner of eye.

Thorax: Pronotum about 5/6 as long as width of base; transverse constriction across apical ⅓, moderately impressed dorsally, distinctly impressed laterally; anterior margin feebly arcuate; anterolateral angles obtuse, not produced; sides sinuous; base trisinuate; posterolateral angles acute, not produced posteriorly; a broad sublateral carina on basal ½; disc between carinae tumid; depressed between sublateral carinae and posterolateral angles; surface microalutaceous; with few moderately coarse punctures as on head, punctures obscured by pubescence. Elytra almost 5× longer than pronotum; depressed on disc at about basal ⅓; apices evenly

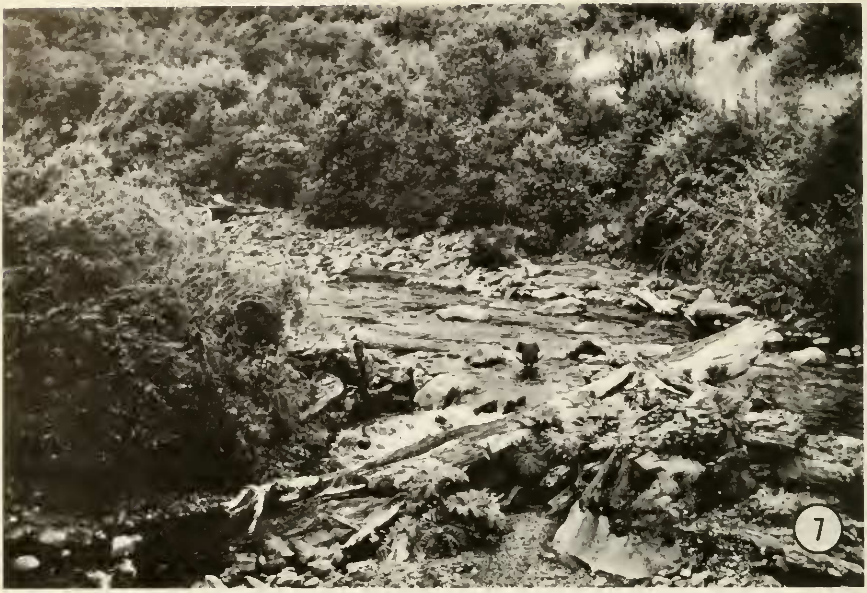


Fig. 7. *Hydora lenta*, type-locality.

rounded; humeri moderately swollen. Each elytron with 11 rows of coarse punctures but rows (including accessory row) effaced on basal ⅓ and very indistinct on apical ⅔; only lateral rows 7 to 11 reasonably distinct near midlength; coarse punctures of lateral rows separated by about width of a puncture. Scutellum swollen, triangular; sides shorter than basal width. Prosternum short in front of forecoxae. Prosternal process elongate, extremely narrow; about 9.3× longer than wide; apex blunt and fitting into a deep fovea in mesosternum. Mesosternum with a broad, shallow depression between midcoxae. Metasternum with strong ridge behind mesosternal depression then depressed before becoming swollen on discal area; entire surface pubescent. Tarsal claws moderately stout, unmodified.

Abdomen: Sterna uniformly pubescent; microalutaceous and moderately coarsely and sparsely punctate; punctures separated by 2× their width and obscured by pubescence. Lateral margins of sterna 1–4 (but especially 2 and 3) expanded and upturned forming a flange which clasps epipleura.

Male genitalia: As illustrated (Fig. 6).

Female.—Unknown.

Type-data.—Holotype ♂: CHILE: *Osorno Province:* Parque Nacional de Puyehue, Anticura, in Rio Anticura, 1 Feb. 1978, Paul J. Spangler; USNM Type No. 76183, deposited in the National Museum of Natural History, Smithsonian Institution.

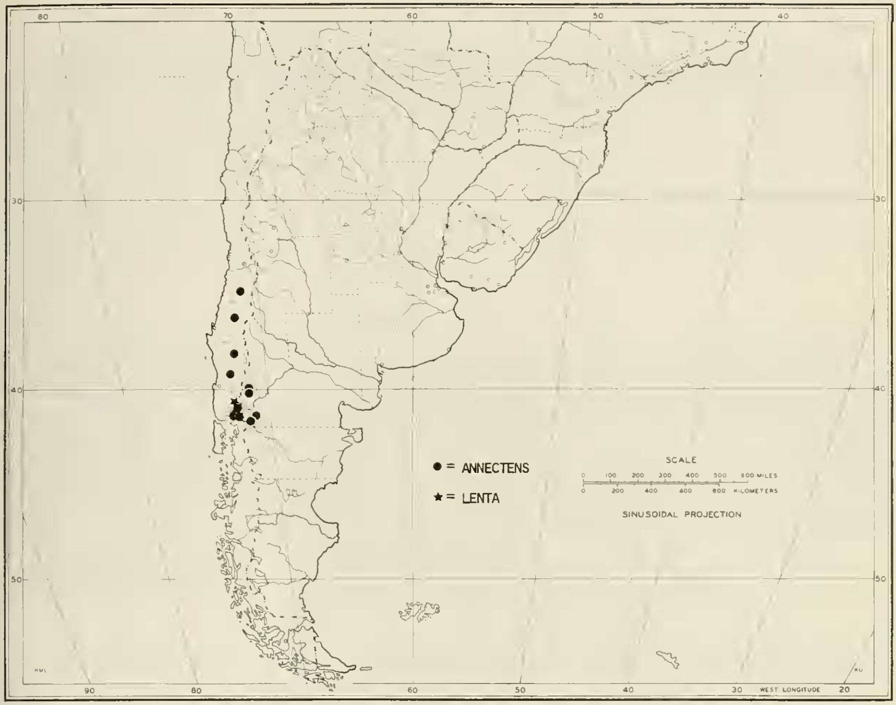


Fig. 8. *Hydora annectens* and *H. lenta*, known distribution.

Paratype: CHILE: *Osorno Province:* Parque Nacional de Puyehue, Anticura (4 km W), 330 m, 3 Feb. 1978, Paul J. Spangler, 1 male; deposited in the National Museum of Natural History, Smithsonian Institution.

Etymology.—The name *lenta* is from lentus, L.—slow; in reference to the slow moving behavior of the type-specimens when they were collected.

Habitat.—The holotype was found by pulling limbs and logs out of a logjam (Fig. 7) in the middle of the Rio Anticura; the specimen was found above water on a damp log.

Comparative notes.—*Hydora lenta* may be distinguished from *Hydora annectens* by the following combination of characters: (1) Elytral rows of coarse punctures effaced on basal third and indistinct or effaced apically; (2) scutellum swollen and sides shorter than basal width; (3) elytra with shallow, elongate sublateral depression at about apical fourth in addition to the broad depressions on each side of suture at basal third; (4) male genitalia with parameres short and broad apically (Fig. 6); and (5) size smaller, 2.9 mm vs. 3.6 to 4.5 mm.

Key to the Species of *Hydora* from Austral South America

- Elytral rows of punctures coarse and distinct from base to apex; prosternal process moderately wide between procoxae, 3.6× longer than wide; total body length 3.6 to 4.5 mm .. *annectens*, new species
- Elytral rows of punctures fine to effaced on base and on apex; prosternal process exceptionally narrow between procoxae, 9.3× longer than wide; total body length 2.9 mm .... *lenta*, new species

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